



It Takes Two to ... Network

Of course, it's important to choose a router capable of meeting the fast-changing network demands in the hybrid-work era. But don't forget the other end of the connection.

Taking a cue from PC gamers, consumers and enterprise IT buyers increasingly understand that the best networks are built with both wireless routers and laptops with the most advanced Wi-Fi 6 technologies.

November 2021
Analyst: Mike Feibus

Produced in association with:

Qualcomm

Contents

Executive Summary	4
Analysis.....	6
History and Background	6
Advanced Features	7
Four-Stream DBS (Dual-Band Simultaneous)	7
160MHz Channels	7
Uplink Multiuser MIMO (UL MU-MIMO).....	8
4K QAM.....	9
Conclusions	10

Executive Summary

The change in wireless networking since the start of the pandemic has been remarkable – not only because of how dramatically it shook up internet demand, but also because of how quickly it happened.

New wireless traffic patterns typically develop over an extended period. It took six years, for example, for video streaming to grow from about a third of all internet traffic to two thirds.

But the current state of wireless network demand took shape seemingly overnight, at the start of the pandemic. In the first quarter of 2020, for example, [broadband data consumption shot up 47 percent](#), to 402.5GB from 273.5GB during the year-earlier quarter.

Of course, consumers are not only streaming much more video from sites like Disney+, Netflix and YouTube. They've also been engaging in far more videoconferencing, a relatively new activity for many. Videoconferencing is more demanding than content streaming because it requires real-time traffic upstream as well as downstream bandwidth.

Videoconferencing quickly dominated online activity during business hours, mushrooming tenfold in a matter of weeks. Zoom, the poster child for online video collaboration in the post-pandemic age, actually saw the number of daily meeting participants explode 30 times to 300 million in April 2020, the first full month of lockdowns. In December 2019, Zoom meetings had just 10 million participants.



And as hybrid work – and, increasingly, hybrid learning – evolves into a long-term approach, demand for videoconferencing bandwidth continues to grow from the new higher base.

For the second quarter of 2021, for example, Zoom revenues topped \$1 billion for the first time, growing 54 percent over second-quarter 2020 revenue of \$663.5 million.

Source: Zoom, FeibusTech

In addition to demanding comparatively scarce upstream bandwidth, videoconferencing traffic is also different from nighttime video streaming in that it is largely business-related activity, not pleasure. As a result, poor quality is no longer just annoying – it's also potentially damaging.

The sudden appearance of all those essential two-way connections – along with a boom in bidirectional gaming traffic, which is arguably non-essential even though it can be far more intense and demanding – yanked the network in a new direction, expanding from serving primarily downstream entertainment packets to ensuring that multiple video conversations are all working simultaneously.

That's a tall order. Which is why so many IT and household network caretakers have been flocking to wireless mesh networks built around the latest Wi-Fi 6 standard.

Installing Wi-Fi 6 mesh networks is a smart first step, to be sure. The problem for many, though, was that it was the only step they took. Because while they spent time and money to identify and buy the most capable routers, they also purchased new laptops without any thought as to whether the built-in Wi-Fi 6 chipset would take full advantage of their new network hardware.

That's starting to change now. Ironically, it is PC gamers' quest for any high-speed, low-latency edge they can find – as opposed to those with business or academic considerations – that is driving demand for the best Wi-Fi 6 chipsets in the latest laptops. And the movement is gaining steam, especially now that the performance and feature gap between the default Wi-Fi 6 bundling option and the state of the art is widening.

As a result, savvy fleet managers increasingly are prioritizing laptops configured with Qualcomm's FastConnect 6900 chipset, because the 6900 supports more features that help deliver high-speed, low-latency and low-power collaboration, regardless of whether employees are at home or in the office.

Specifically, the FastConnect 6900 is the only Wi-Fi 6E chipset that supports the entire suite of advanced features, most notably:

- Four-stream DBS, which enhances reliability while boosting throughput and lowering latency. Windows 11 supports the capability, and it only works on laptops with FastConnect 6900 Wi-Fi,
- 160MHz channels for higher throughput – in the 5GHz band as well as emerging 6GHz,
- Uplink multi-user MIMO for unparalleled videoconferencing performance, and
- 4K QAM to maximize throughput.

This paper takes a closer look at these four features, and how they can help videoconferencing quality and reliability as well as overall connected performance.



Analysis

History and Background

As everyone quickly learned during the first few weeks of the pandemic, remote collaboration comes with a set of expectations that are quite distinct from face-to-face meetings. There were some new behaviors and protocols to adopt, like finding a quiet spot, paying attention to what's behind you and working the mute button.

As well, myriad new hardware requirements cropped up. And once it became apparent that remote collaboration would endure for months if not years, consumers as well as enterprises, schools, government agencies and other organizations began purchasing hardware to enhance videoconferencing quality.

[Sales of ring lights for home offices](#) at production lighting maker J.F. Wescott, for example, quadrupled in 2020. PC webcams and other videoconferencing products were Logitech's fastest-growing businesses last summer, helping to propel quarterly sales to \$1.26 billion from \$720 million the previous year.



Naturally, many consumers also focused on modernizing their home networks, snapping up advanced wireless platforms. Some employers even subsidized or reimbursed purchases of selected systems.

Which is why Wi-Fi router suppliers posted a banner year in 2020. Netgear, for example, grew 26 percent in fiscal 2020 to \$1.26 billion – a dramatic turnaround from 2019, when sales slipped 5.7 percent to \$999 million.

Curiously, many consumers and enterprise buyers ignore the other half of the wireless connection. But with demands on network performance more intense than ever – and the gap widening between baseline and state-of-the-art Wi-Fi 6 chipsets – that approach is becoming less and less tenable.

Gamers, who often lose online battles due to the smallest performance deficiencies, understand their potential is only as good as the weakest link. Which is why they're perennially upgrading their rig, routinely spending hundreds of dollars on top-of-the-line upgrades like processors and graphics cards.

And since the pandemic, gamers have discovered that they're not just competing against virtual opponents. Increasingly, they're also vying with family members for the same precious real-time two-way bandwidth. Which is why they're among the first to seek out laptops with the best Wi-Fi.

Non-gamers and businesses are now beginning to follow gamers' lead. Although it's not gaming, which can feel like life and death at times, the distraction and frustration of poor videoconferencing quality can wear on prospects over time.

Toward that end, FeibusTech believes that consumers and business buyers are poised to respond to hardware makers that bundle Wi-Fi with key best-of-breed features in the systems they sell.

Advanced Features

Here are the features to look for to ensure the best, most reliable performance for video collaboration and other critical productivity tasks. And, of course, gaming.

Four-Stream DBS (Dual-Band Simultaneous)

Traffic between a router or access point and a laptop normally occurs on either the 2.4 GHz or 5 GHz band. (With the emergence of Wi-Fi 6E, 6 GHz is now an option as well.)

As the name implies, dual-band simultaneous employs two radios to either a) boost throughput by splitting transmissions across the two bands, or b) increase reliability and lower latency by sending the same data across two frequencies, which greatly improves the chances that the data arrives intact and on time. Performance-sensitive applications must be written to take advantage of DBS.

Smartphone makers have been targeting gamers for some time with two-stream DBS – that is, a 1x1 + 1x1 configuration – to improve game play by lowering latency.

With four-stream DBS (2x2 + 2x2) – or Wi-Fi Dual Station, the newest, most advanced form of the technology – online games, videoconferencing and other performance-sensitive apps can have the best of both worlds. To do that, an application would employ one antenna on each radio to enhance reliability and coverage, and a second pair of antennas to lower latency and improve throughput.



And now that four-stream DBS is coming to the PC via the Qualcomm FastConnect 6900, application developers are poised to enable the feature later this year and into 2022. Already, Valve has added support for Dual-Station in its Steamworks SDK, which can put wireless gameplay on par with wired.

And Microsoft now supports Dual-Station on Windows 11 PCs built with the

FastConnect 6900 chipset, paving the way for more applications to adopt it. Expect to see videoconferencing apps as well as more game platforms to come.

160MHz Channels

Sending data across two different radios is just one way to increase throughput. Another way is to send wider slices of data on the same band.

Doubling channel widths to 160 MHz, which effectively doubles potential throughput, is gaining momentum now that 6GHz is coming available. The odds of finding an unused 160MHz channel in the 6GHz band are far better, as it's much wider and far less crowded than the mature 5GHz band.

Interestingly, as more enterprises are deploying tri-band platforms, thereby moving 5GHz congestion to the 6GHz band, the odds of finding an unused 160MHz channel on 5GHz are also improving.

Many new wireless PC chipsets like the FastConnect 6900 support 160MHz channels on both the 5 & 6GHz band. That will become important for enterprises that want to take full advantage of available spectrum. It could also give network administrators in regions that don't yet have authorization for 6GHz Wi-Fi a way to carve out performance for mission-critical connections.

Uplink Multiuser MIMO (UL MU-MIMO)

If there was ever a technology designed for households with several people all videoconferencing simultaneously, it is UL MU-MIMO. And early testing suggests that the FastConnect 6900 from Qualcomm, which consistently has been the first to market with the latest MU-MIMO features, boasts a substantial performance lead.

There are actually three components to the technology, as its lengthy moniker telegraphs. MIMO, or multiple-input/multiple-output, was one of the primary new features in the 802.11n – now Wi-Fi 4 – spec when it was announced 15 years ago. MIMO harnesses small differences in radio wave travel times to pack more data into a given interval.

Multiuser MIMO employs more antennas on the access point to achieve MIMO throughput for more than one device on the network. It was introduced as part of 802.11ac wave 2 – wave 1 and wave 2 are both now considered Wi-Fi 5 – as an optional feature. The Wi-Fi 6 (802.11ax) standard makes MU-MIMO required. Qualcomm was the first to support 8x8 MU-MIMO, the most advanced option.



Until recently, MIMO primarily has been a downstream enhancement, for two reasons. First, network traffic historically flowed predominantly downhill, so it made sense to prioritize it over upstream. And second, uplink MU-MIMO is more difficult to implement, because there is much less room for error. Most broadband connections feature many times more downstream bandwidth, which means that a new uplink stream typically adds far more stress to the network than a new downlink stream. Conversely, an efficient uplink MU-MIMO design can translate into a much bigger improvement in network performance.

Uplink MU-MIMO is expected to be included in the next revision of the Wi-Fi 6 spec when it is published, likely early in 2022. In the meantime, Qualcomm was the first to support uplink MU-MIMO. The company offers Wi-Fi 6 chipsets with support for uplink MU-MIMO for both access points and client devices like smartphones and laptops.

To be sure, uplink MU-MIMO was potentially lifechanging for some workplaces in the months leading up to the pandemic, when Qualcomm started delivering it. Like, for example, video producers, graphics arts houses and other businesses and departments that routinely created and shipped large files.

Of course, uplink MU-MIMO is now critical for the vast majority of wireless networks. And with hybrid work arrangements quickly becoming permanent, competitive Wi-Fi chip suppliers surely will be pressured into closing their uplink MU-MIMO performance gap with Qualcomm.

4K QAM

QAM, short for quadrature amplitude modulation, is a technique for packing more bits into a single waveform. So it can be a powerful tool for jacking bandwidth in the right conditions.

QAM was first implemented in Wi-Fi with 802.11 a/g specs, which supported up to 64 QAM, with fallback to 16 QAM as well as pre-QAM modulation schemes.

With 802.11ac, or Wi-Fi 5, 256 QAM became standard. And 802.11ax/Wi-Fi 6 brought 1K QAM, the current state-of-the-art spec. 4K QAM is on the docket for Wi-Fi 7. But Qualcomm is already supporting it – which means dense, highly-utilized networks could potentially benefit. Of course, you'll need Qualcomm Wi-Fi 6 chipsets at both ends of the connection in order to take advantage of 4K QAM's higher potential data rates.



Conclusions

The pandemic has forever altered the way we make use of the internet, injecting videoconferencing into the heart of everyday personal, professional and academic life.

Delivering video streaming for entertainment's sake at the end of a long workday is no longer job one for wireless networks. Now, the primary role is ensuring that multiple two-way video calls run smoothly during the workday.

That takes a different set of capabilities. As if on cue, those capabilities are all coming available now, through advanced Wi-Fi 6 routers and access points as well as differentiated laptops and other mobile devices with best-of-breed Wi-Fi built in.

Led by gamers, consumers and business buyers increasingly understand that it's not enough to simply upgrade the network. Choosing laptops with the right features can also make a huge difference in how well that network performs.

Buyers should be sure that the systems they purchase come with Wi-Fi 6 chipsets that support the following advanced features:

- Wi-Fi Dual Station with 4-stream DBS,
- 160MHz channels for 5GHz as well as 6GHz,
- Uplink multiuser-MIMO, and
- 4K QAM.

Qualcomm's best-of-breed FastConnect 6900 Wi-Fi 6 chipsets support the features, all of which are either part of the latest standards or soon will be. Plus, they're built by wireless pioneer Qualcomm, which has more experience managing complex cellular and Wi-Fi networks than any of its competitors.

That helps explain why Microsoft worked with Qualcomm to bring Wi-Fi Dual Station to Windows 11. The feature only works with FastConnect 6900, in fact.

Hardware manufacturers would be wise to prepare more laptop configurations with integrated FastConnect 6900, either as an upgrade option if not part of standard SKUs. Because after a year contending with spotty Zoom lessons and Teams meetings, buyers are primed to respond to laptop offers with technology that will improve their collaboration experience.



FEIBUSTECH

⋮
clear ▪ critical ▪ independent
⋮

FeibusTech

P.O. Box 25685

Scottsdale, AZ 85255

www.feibustech.com

+1-480-922-3244

Copyright © 2021
All Rights Reserved